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C3P Center for Pollution Prevention Program

"Global Collaboration in Sustainable Environmental and Alternative Energy Strategies"

NASA esa

Sound Levels Nearby an Eolic Wind Turbine Park

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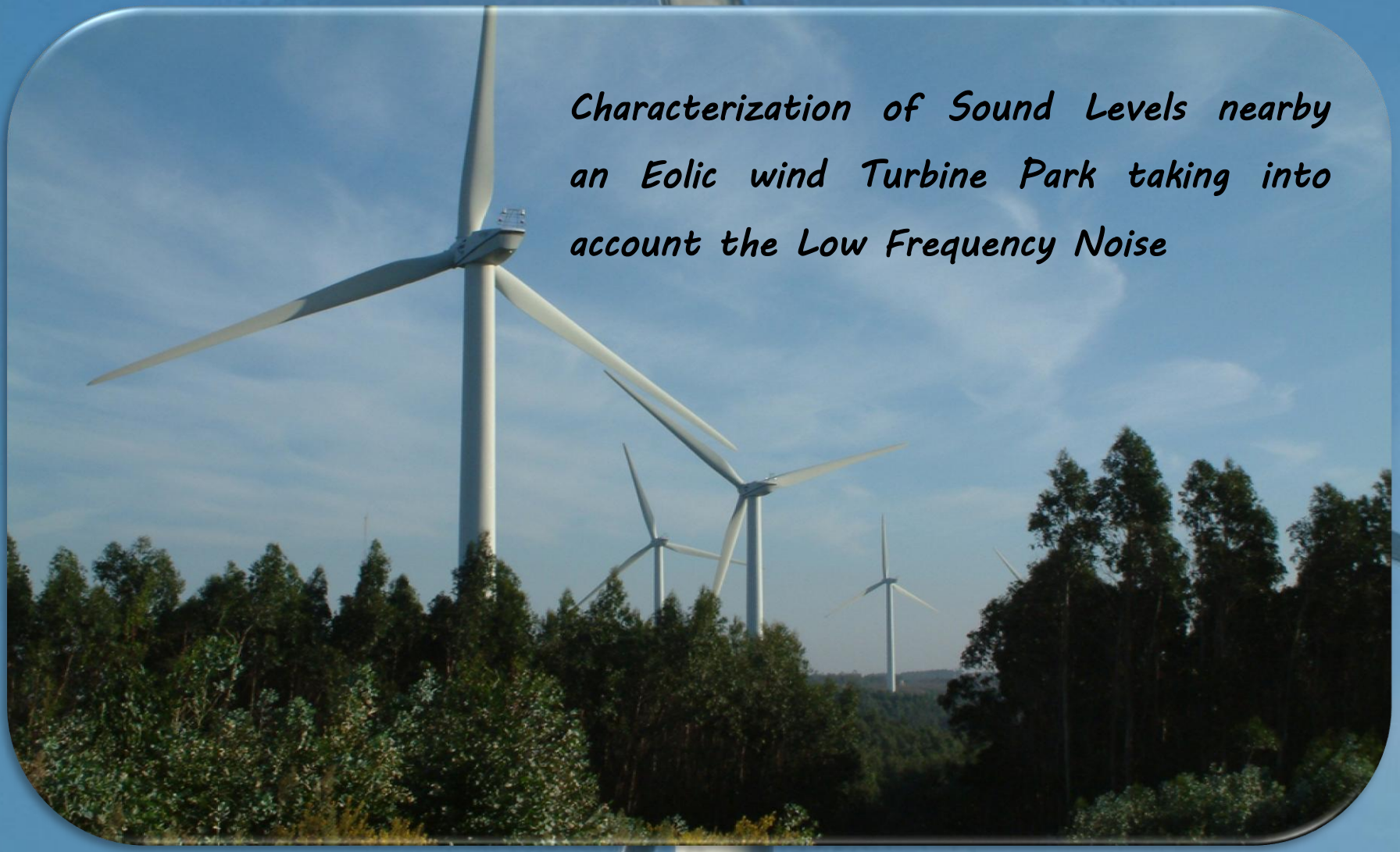
Summary

- Objective
- Background and Motivations of Research
- Methods
- Conclusions

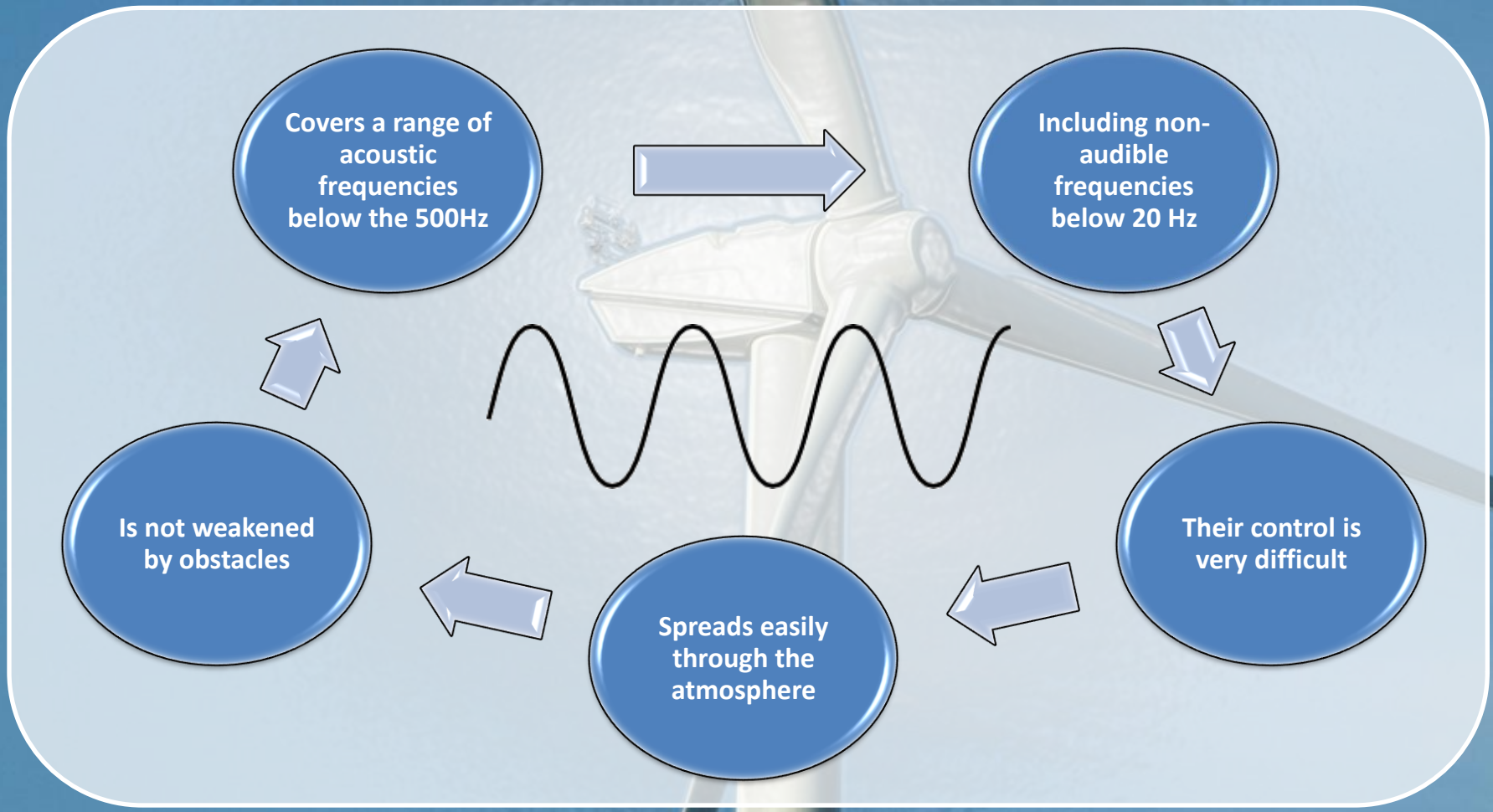
OBJECTIVE



Characterization of Sound Levels nearby an Eolic wind Turbine Park taking into account the Low Frequency Noise

CONCEPTS

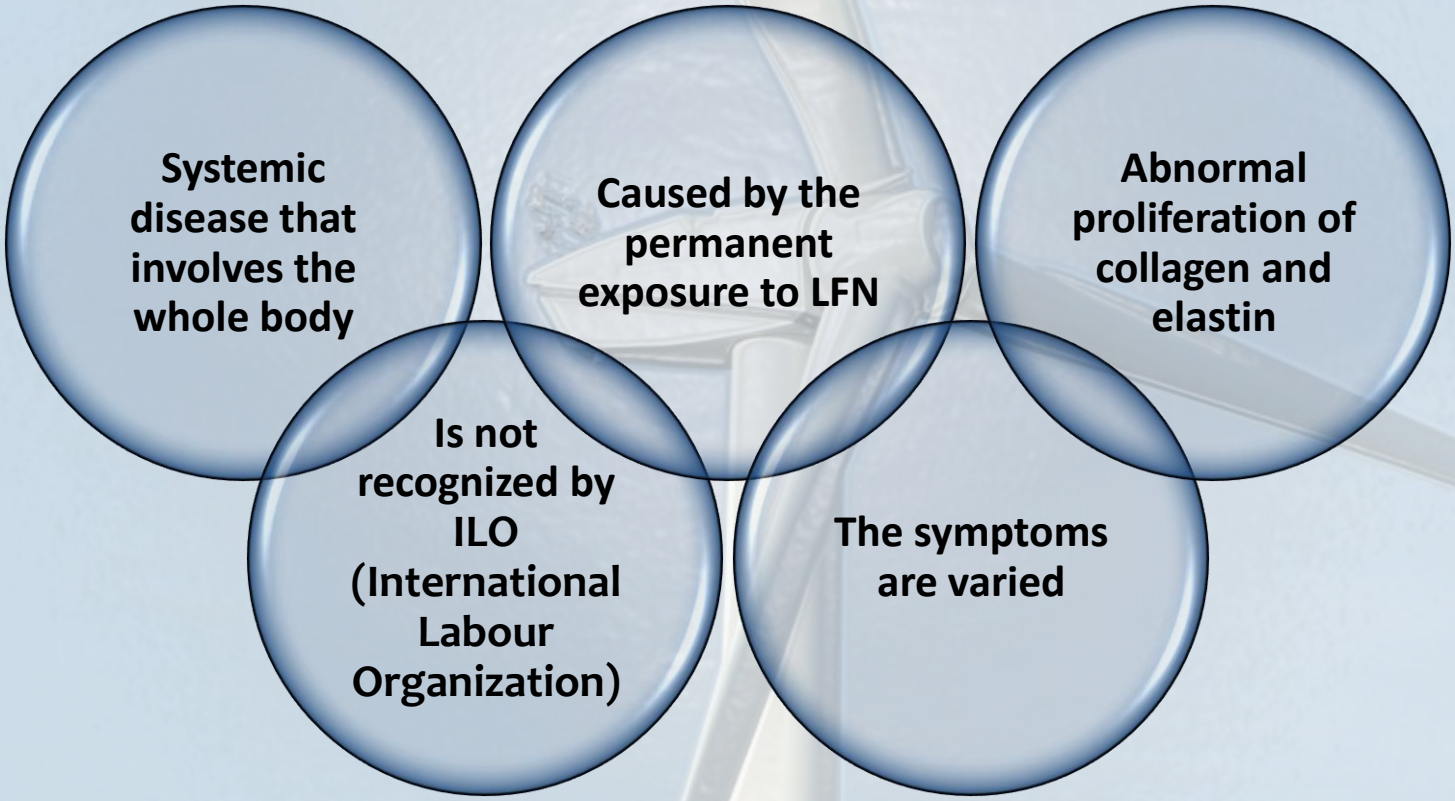
LOW FREQUENCY NOISE (LFN)



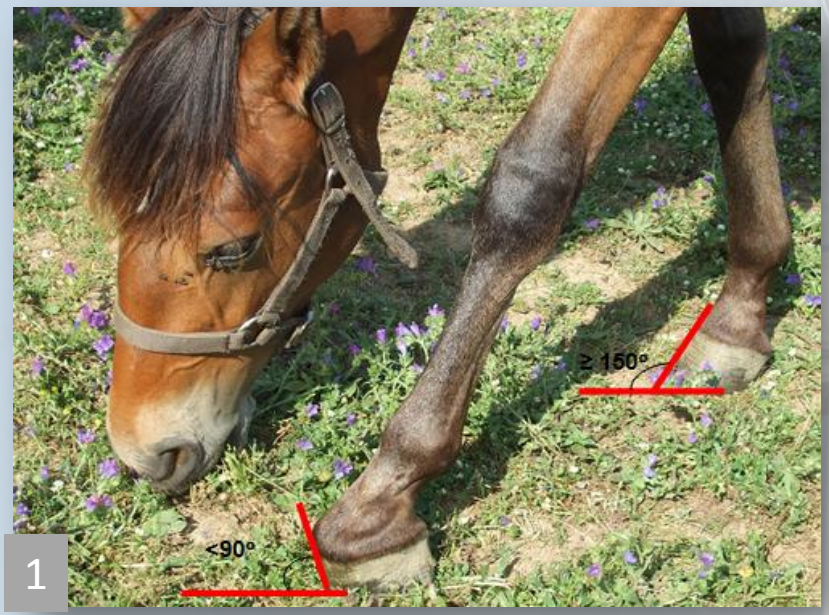
Diseases Associated with Exposure to LNF

- Vibroacustic Desease (VAD)
- Retraction of the flexor tendon of the forelegs in horses

Vibroacustic Desease (VAD)



Retraction of the Flexor Tendon of the Forelegs in Horses



1

1. An normal hull has an angle with the ground about 150° when the disease are developed the angle becomes smaller than 90° who create problems of locomotion

2

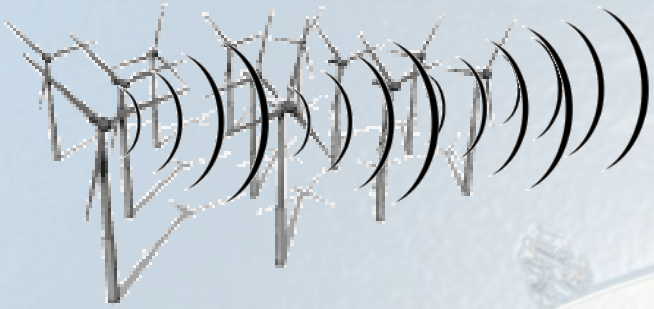
2. In more extreme cases occurs the breaks in the rear of the hull due to pressure inflicted on the front due the retraction of the tendon

MOTIVATION

- Around a farm was installed an Eolic park in 2006;
- Beginning of the development of psychological and physical alterations in the people and horses;
- Symptomatology in the persons associated to VAD;
- Agitated and scared horses, development of reflection of the tendon.

Farme Localization

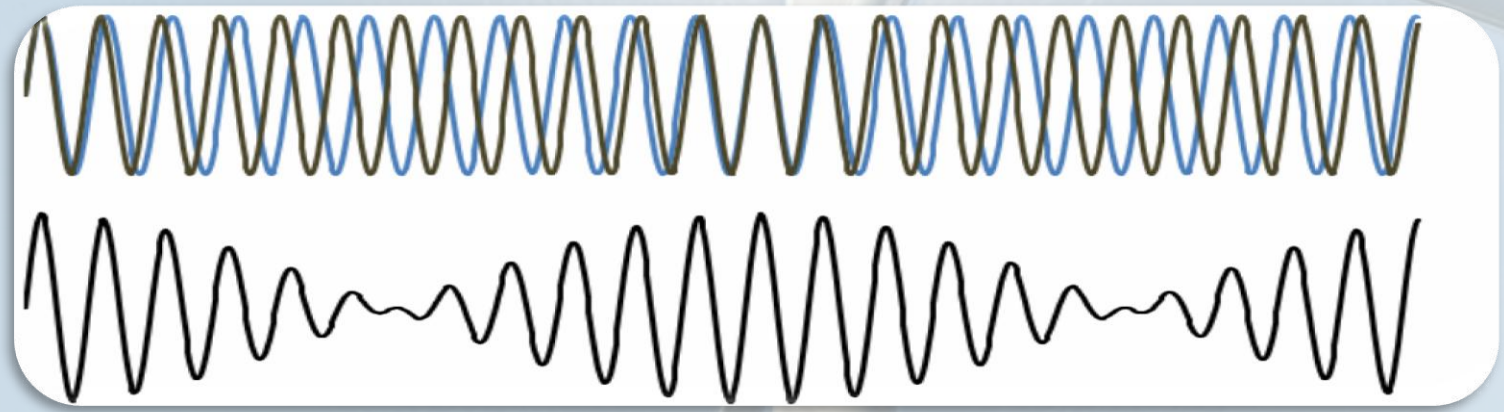
Beat Phenomenon



A set of wind power generators is scheduled to work in a certain speed.
As the wind speed is not constant at all place, there are small variations of the power generators rotation speed.

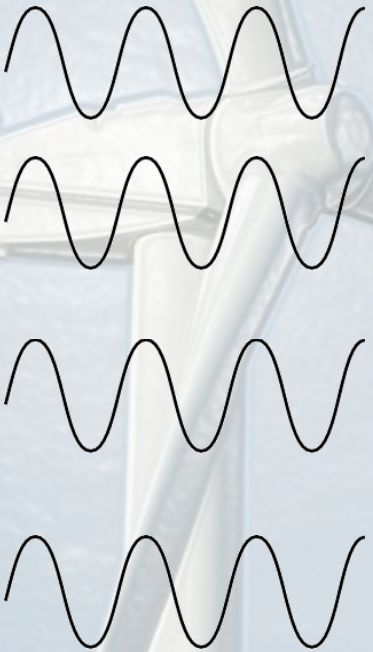
Beating phenomenon

In acoustics, a beat is an interference between two sounds of slightly different frequencies, perceived as periodic variations in amplitude whose rate is the difference between the two frequencies.

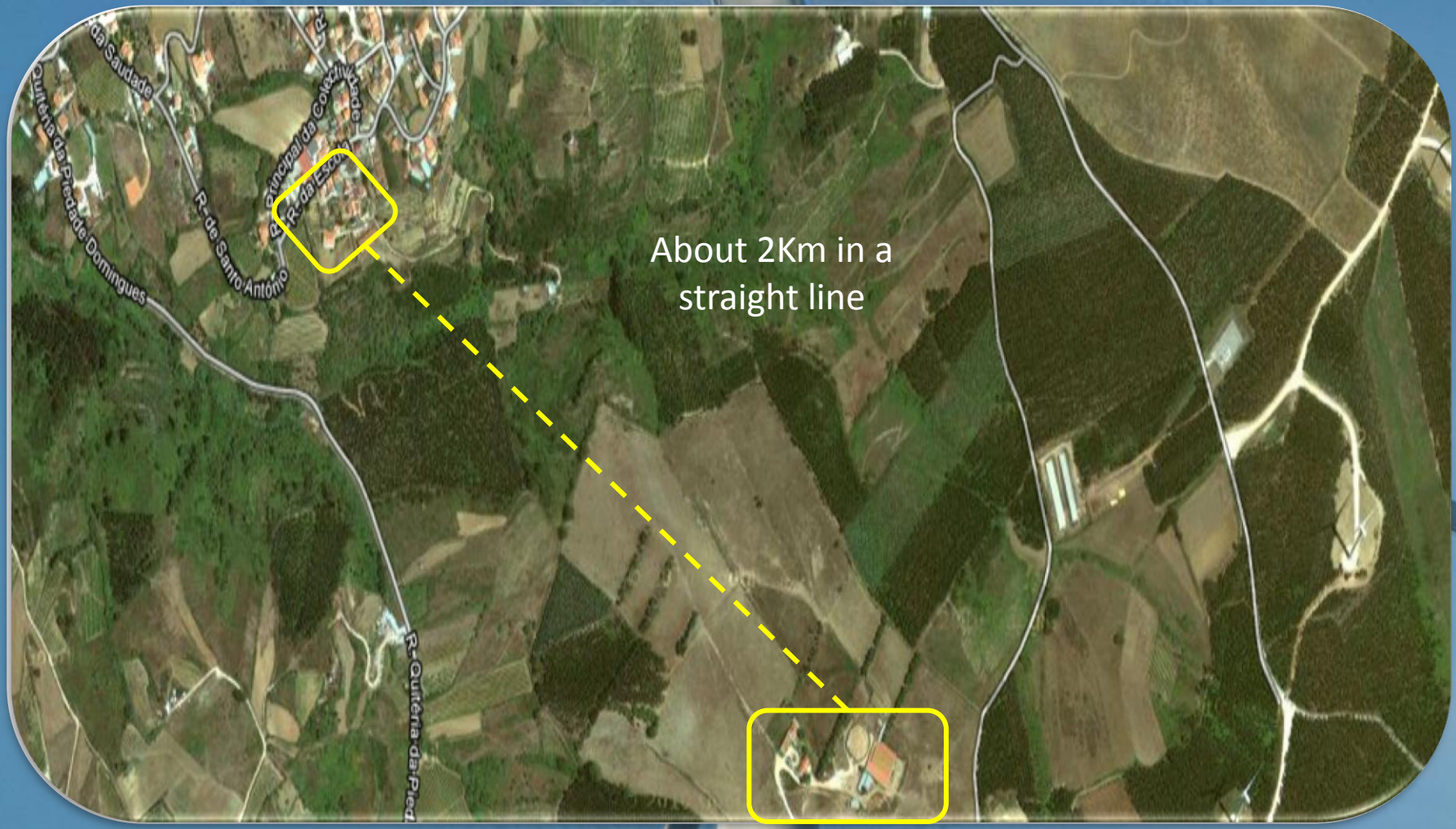


So

p(*t*)
Sound Pressure

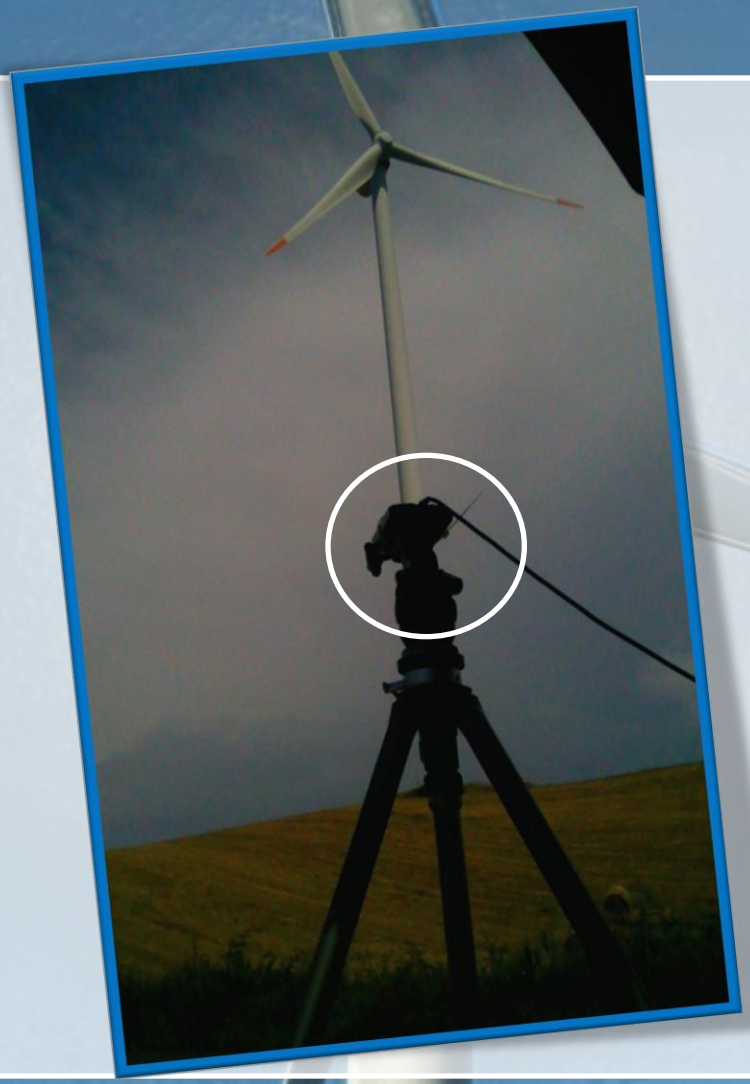


Attenuation Study



Equipment

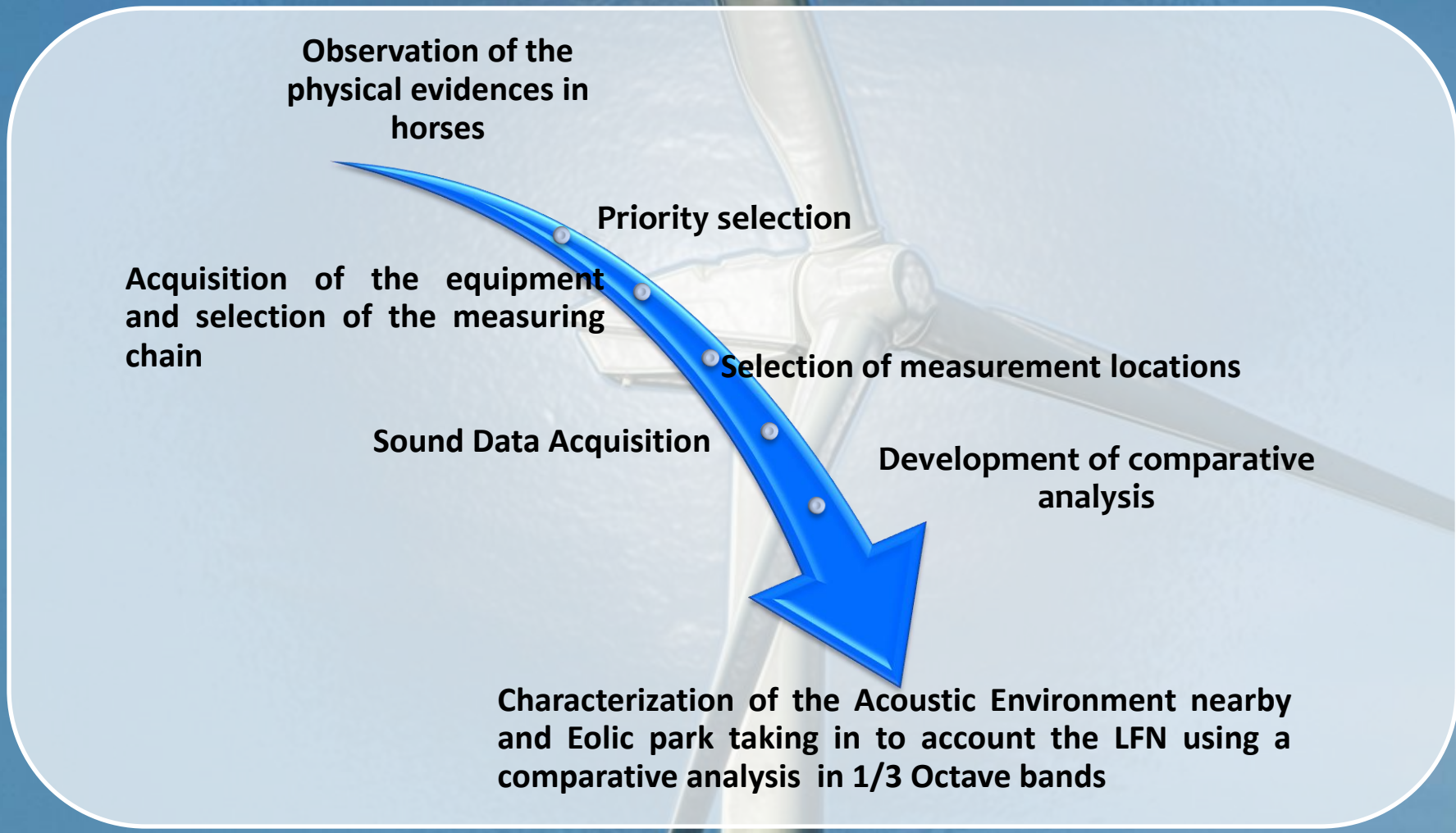
Collector Analyzer
Bruel & Kajaer - *Pulse*



Microphone *Larson Davis 2570 (1" Free* Field)

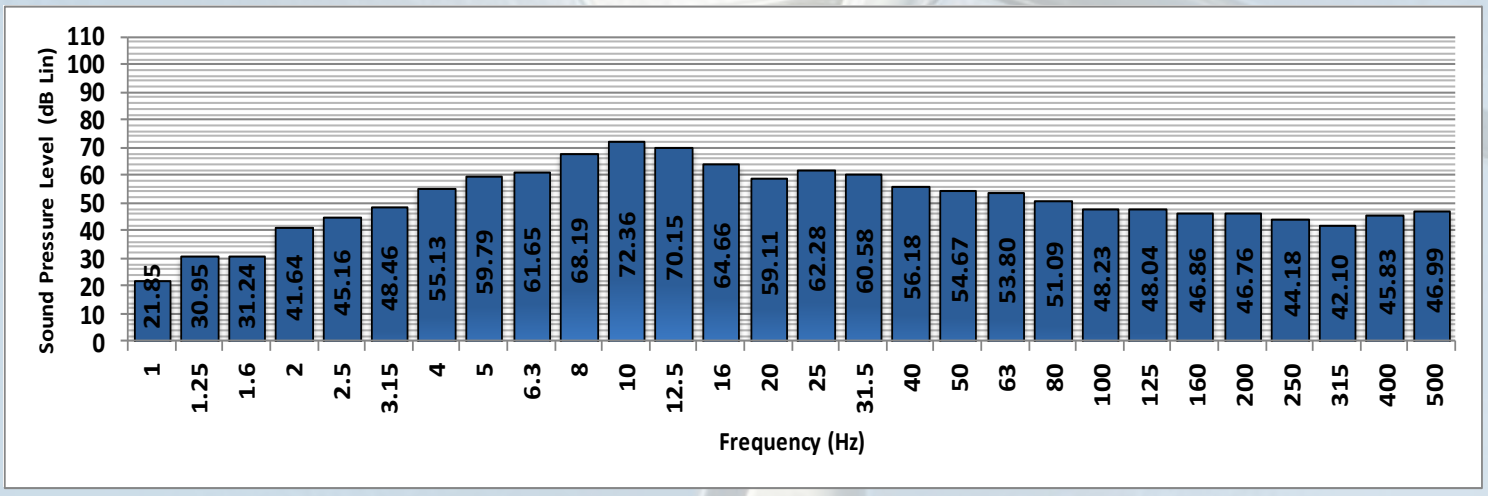
Microphone Preamplifier
Larson Davis Model PRM902

METHODS


Observation of the physical evidences in horses
Priority selection
Acquisition of the equipment and selection of the measuring chain
Selection of measurement locations
Sound Data Acquisition
Development of comparative analysis
Characterization of the Acoustic Environment nearby and Eolic park taking in to account the LFN using a comparative analysis in 1/3 Octave bands

Reference Data

- Sound pressure levels collected within the area of pasture in with presence of acoustic phenomena caused by wind generator (23th June) ;
- Comparative analysis in the frequency range from 1Hz to 500Hz.

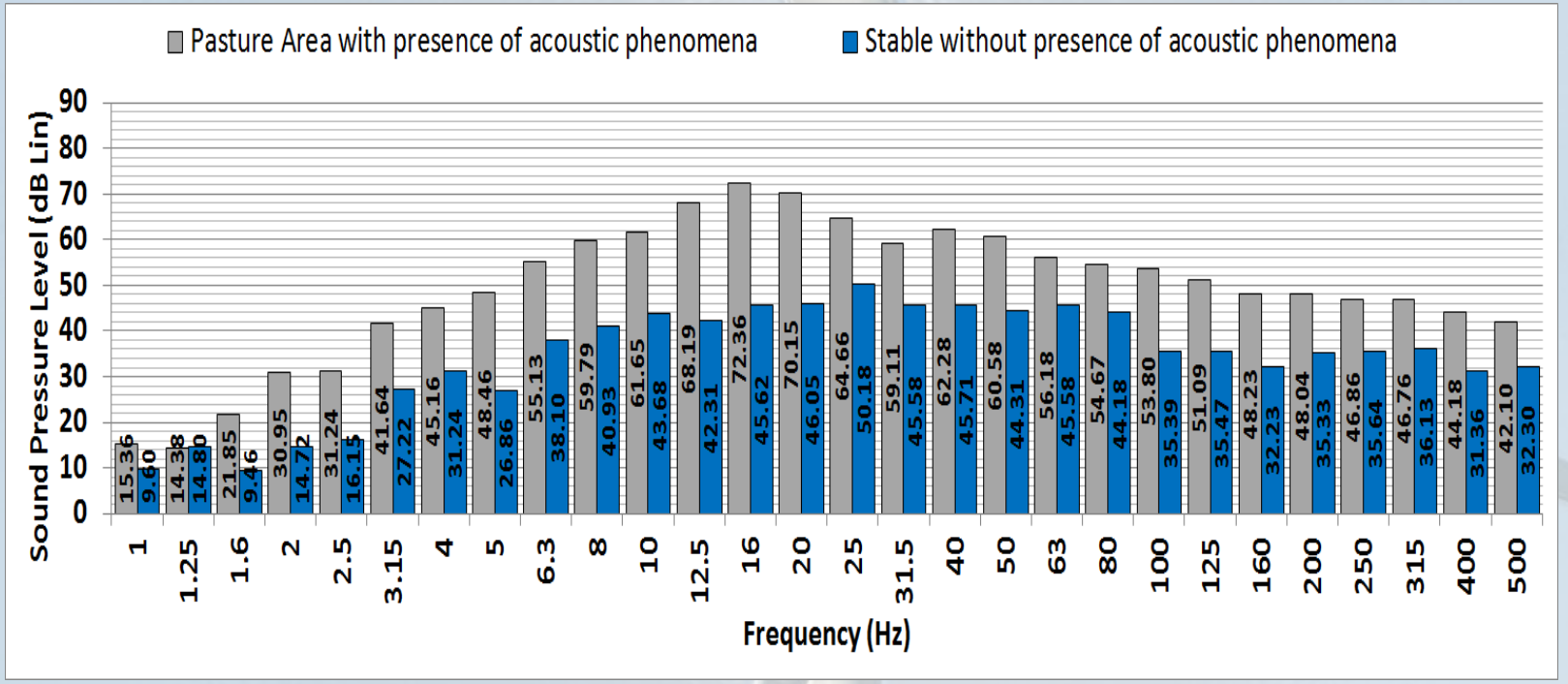


Graphic 1 – Pasture Zone

Measurement Locations

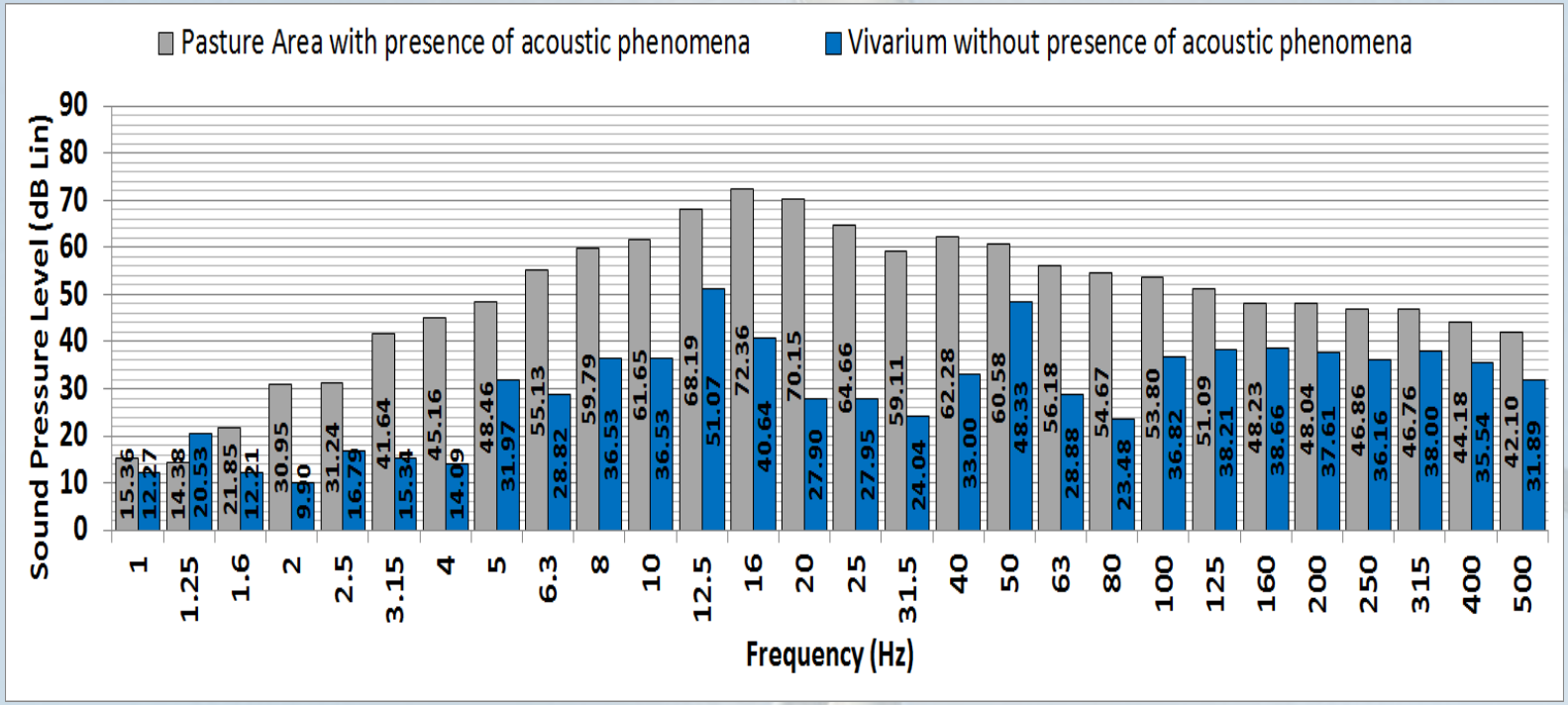
Locations
Farm in Torres Vedras
Stable and Vivarium, Veterinary School of Lisbon
Eolic Park of Sonega, Porto Covo
Farm in Rio Frio, Poceirão
Stable and Arena in Pancas

Data Analysis



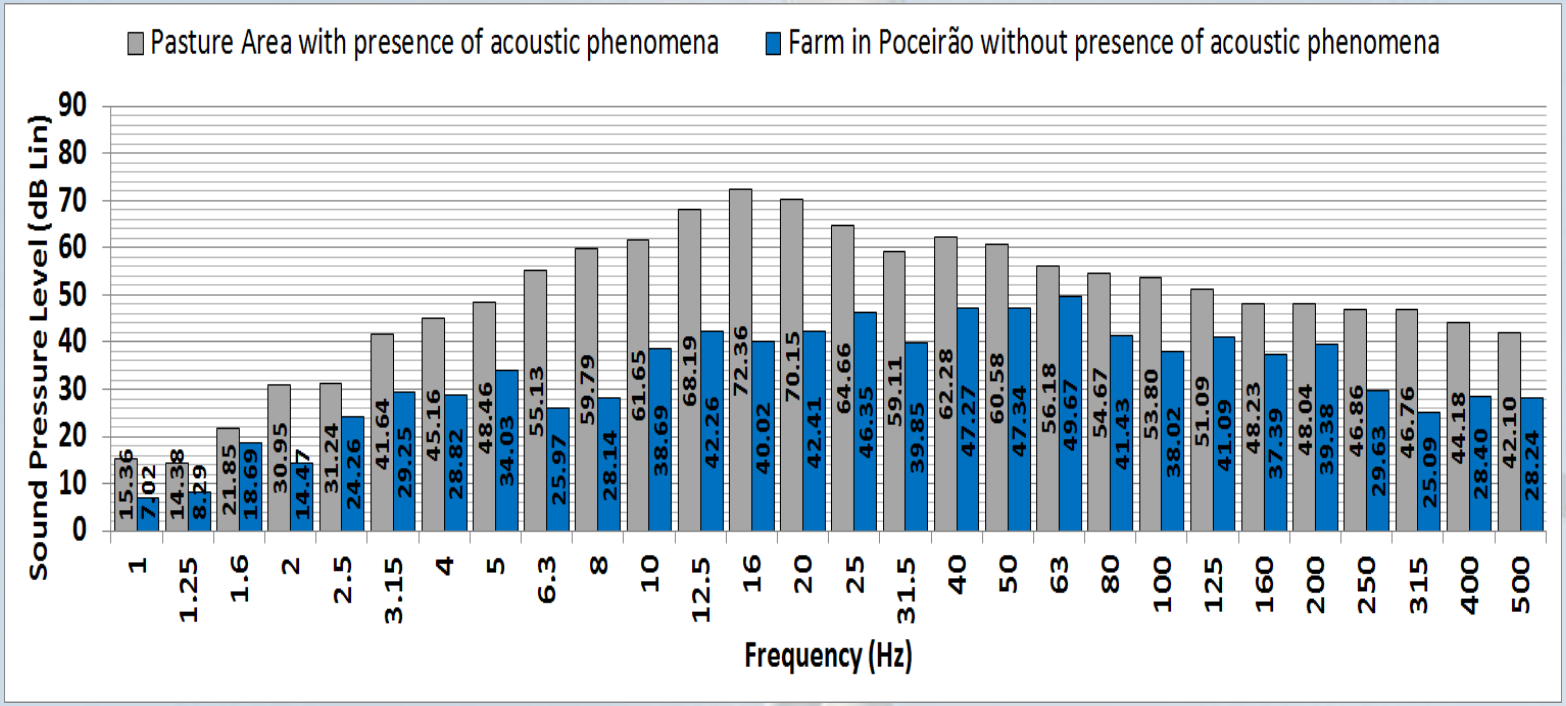
Graphic 2 – Comparison between the distribution of frequencies obtained in the area of Pasture with presence of acoustic phenomena and the stable of the Veterinary School of Lisbon

Data Analysis



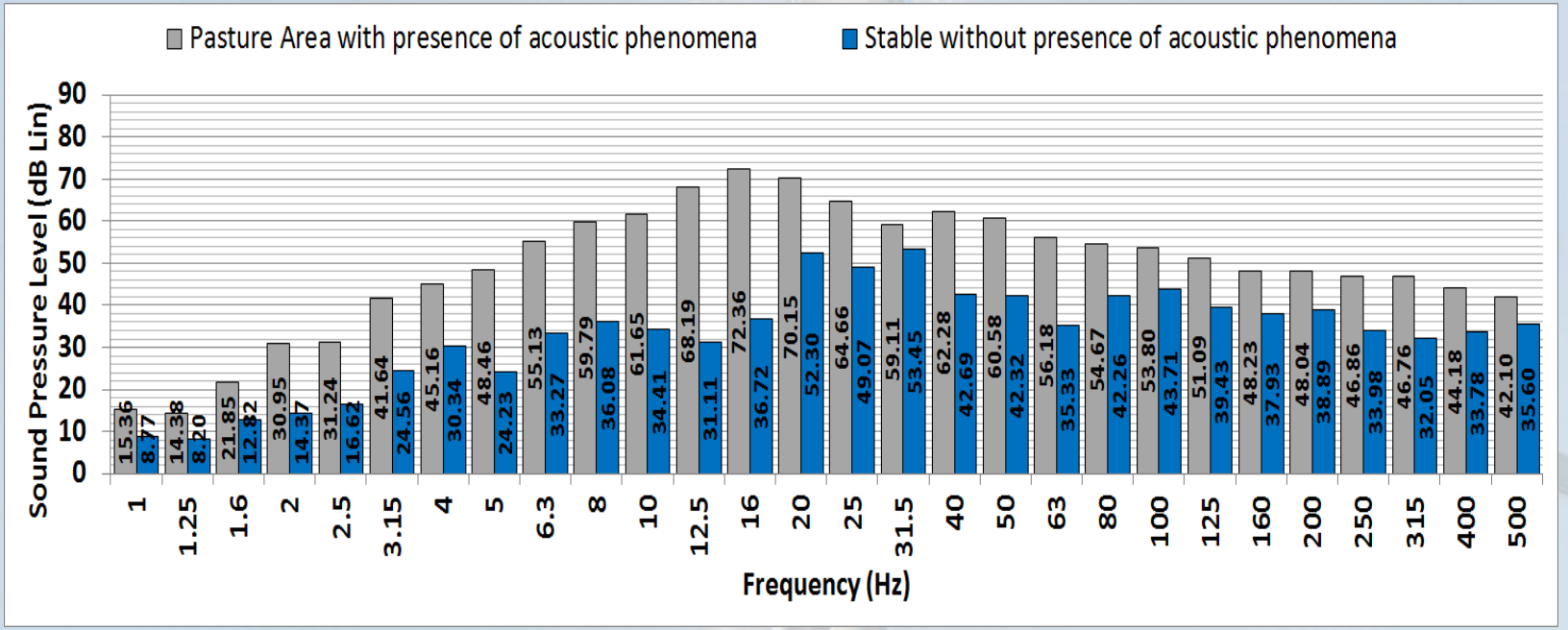
Graphic 3 – Comparison between the distribution of frequencies obtained in the area of Pasture with presence of acoustic phenomena and the Vivarium of the Veterinary School of Lisbon

Data Analysis



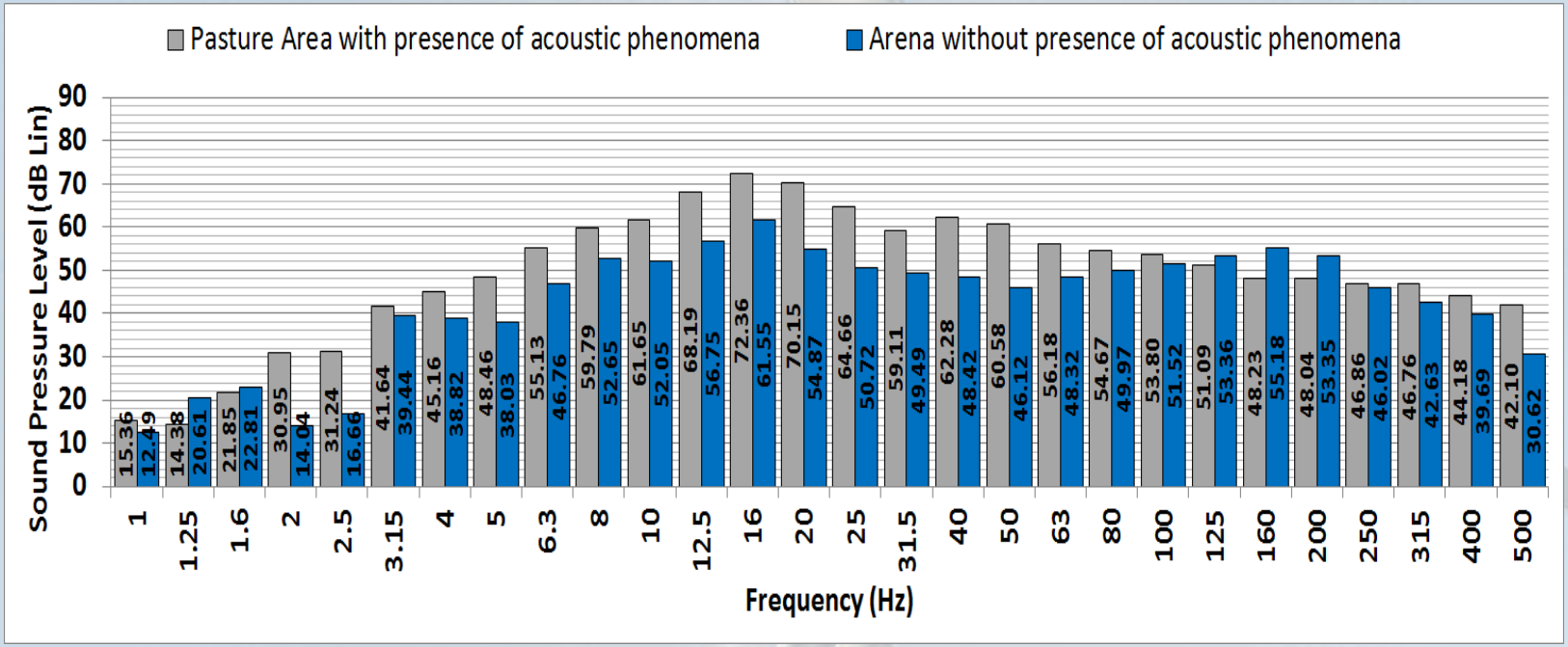
Graphic 4 – Comparison between the distribution of frequencies obtained in the area of Pasture with presence of acoustic phenomena and the Farm in Poceirão area

Data Analysis



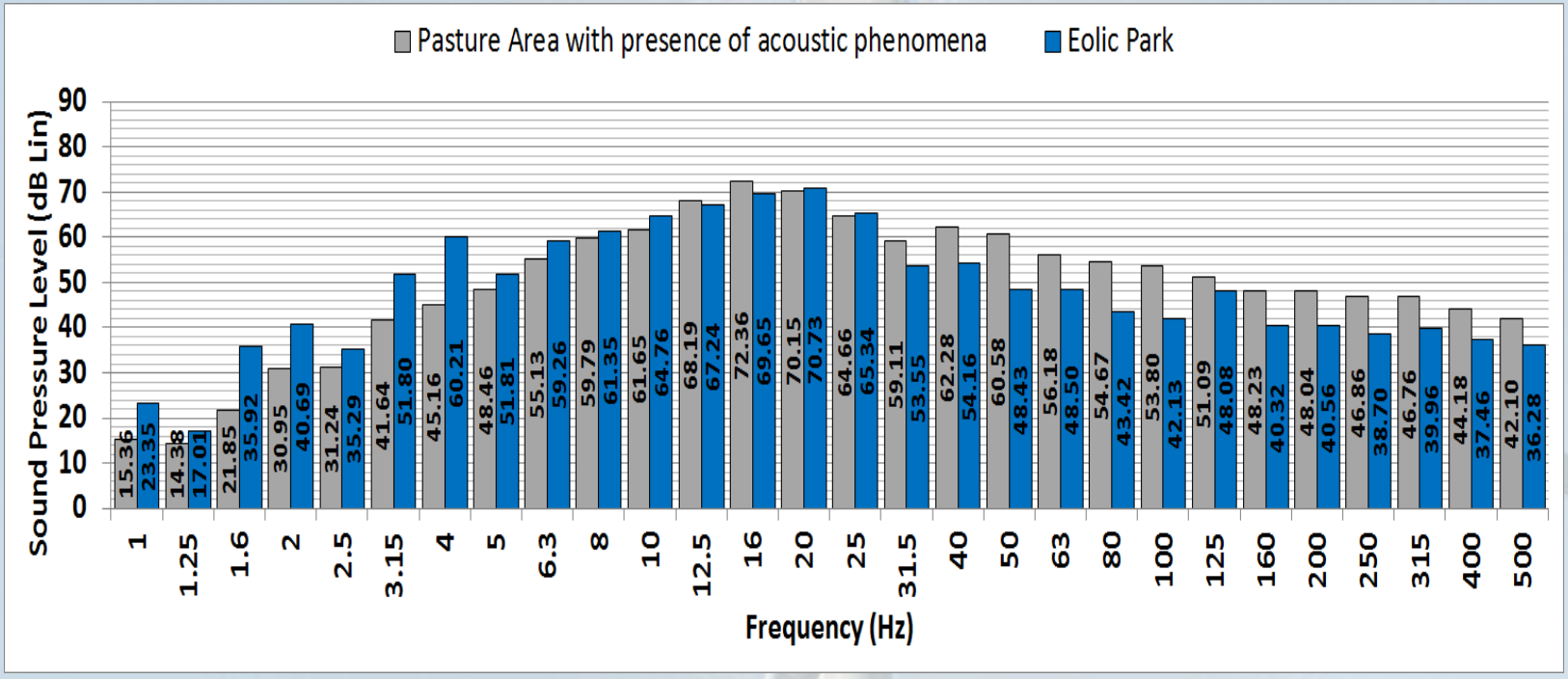
Graphic 5- Comparison between the distribution of frequencies obtained in the area of Pasture with presence of acoustic phenomena and the Stable in Pancas

Data Analysis



Graphic 6- Comparison between the distribution of frequencies obtained in the area of Pasture with presence of acoustic phenomena and the Arena in Pancas area

Data Analysis



Graphic 7 – Comparison between the distribution of frequencies obtained in the area of Pasture and the Eolic Park of Sonega both with presence of acoustic phenomena caused by wind generators

Difficulties

- Lack of legislation for assessment of LFN, which led to the need to define a uniform measurement criteria that would allow to have a basis for comparison between data collected;
- Evaluation of the influence of variations in temperature, humidity and wind speed that affect how the sound wave propagates.

CONCLUSION

- The greater values of sound pressure were recorded between 2,5 Hz and 25Hz;
- Perception of the beating phenomenon due to the number and proximity between the existing wind generators, and due their small differences in frequency of rotation;
- Similar sound pressure levels are recorded at great distances of the farm, which corresponding to a particular feature of the LFN.

Proposals of Improvement in Development

- Conception of noise maps of the study area;
- Consideration of meteorological parameters (wind speed, humidity, temperature);
- Characterization of the morphology of the land with respect to topography and other relevant ;
- Development of tracking methods for horses to compare their location with the areas of highest concentration of noise identified on the maps.

Acknowledgment

FUNDAÇÃO
LUSO-AMERICANA

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Center for Pollution Prevention Program

NASA

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The control of noise was never a priority, perhaps for lack of knowledge of the true effects for human hearing. The Pollution of the water and air are unpleasant to the sight and nose but the noise will be only background noise. Slowly, the studies confirm that the noise causes several diseases, of which deafness is only the most evident.

João Paulo Baltazar
*(in **Reportagem Pouco Barulho** January 5 , 2005)*